Philip John Harrison

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Education

Uppsala University / PhD in pharmaceutical science
November 2017 - September 2023, Sweden

Thesis: Deep learning approaches for image cytometry: assessing cellular morphological responses to drug perturbations.

St Andrews University / PhD in marine biology
September 2002 - January 2006, Scotland

Thesis: Spatial structure and population dynamics of the British grey seal (Halichoerus grypus): inferences from genetic, photo-identification and abundance data.

St Andrews University / MRes in environmental biology (distinction)
2001 - 2002, Scotland

Thesis: Investigating the effects of climate change on humpback whales.

Stirling University / BSc Hons in psychology (2:1)
1995 - 1999, Scotland

Thesis: Pain perception in athletes.

Post-doctoral Research

Chalmers University of Technology / Post-doctoral researcher
2024 - present, Sweden

Morphology-guided *de novo* drug design.

Swedish University of Agricultural Sciences / Post-doctoral researcher
2014 - 2016, Sweden

Exploring the effects of different forestry scenarios on wood decay fungi.

St Andrews University / Research fellow
2011 - 2014, Scotland

Assessing trends in biodiversity of British breeding birds across space and time.

Helsinki University / Post-doctoral researcher
2005 - 2010, Finland

Developing Bayesian state-space models for butterfly metapopulations.

Awards

First place in the adipocyte cell imaging challenge (https://www.ai.se/en/challenge), organised by AstraZeneca and AI Sweden, November 2020.

References

Professor Ola Spjuth, Uppsala University.
070-425-0628
ola.spjuth@uu.se

Professor Carolina Wåhlby, Uppsala University.
018-471-3473
carolina.wahlby@it.uu.se

Teaching and pedagogical experiences

Courses

Pharmaceutical Bioinformatics with Sequence Analysis (3FF276), 7.5 hp.
Location: Uppsala University. Years: 2018-2023.
Advanced level. Language: English.
Roles: Lecturer (machine learning, deep learning), Lab assistant, Examiner.
Methods: Lectures, computer labs, exercises, exam.
Number of students: 20-30 per year.
Extent: 40 hours teaching/year + creating lectures, labs, assignments and grading exams.

Statistics and Prediction in the Pharmaceutical Sciences (3FB607), 5 hp.
Location: Uppsala University. Years: 2019-2022 (twice each year).
Basic level. Language: English.
Roles: Lecturer (machine learning, deep learning), Examiner.
Methods: Lectures, computer labs, exercises, exam.
Number of students: 50-60 per year.
Extent: 16 hours teaching/year + creating lectures, labs and grading exams.

Big Data in Life Science (3FB034), 5 hp.
Location: Uppsala University. Years: 2021-2023.
Advanced level. Language: English.
Roles: Lab assistant.
Methods: Lectures, computer labs, exercises, exam.
Number of students: 50-60 per year.
Extent: 6 hours teaching/year.

Population Biology of Marine Mammals (BL5103)
Location: St Andrews University, Scotland. Years: 2012-2014.
Advanced level. Language: English.
Role: Lecturer (metapopulation dynamics and state-space modelling).
Methods: Lectures, computer labs, exam.
Number of students: 20-30 per year.
Extent: 8 hours teaching/year + creating lectures and grading exams.

Conservation Biology in Fragmented Landscapes (CBFL)
Location: Helsinki University, Finland. Years: 2005-2010.
Advanced level. Language: English.
Role: Lecturer (metapopulation dynamics and state-space modelling), course coordinator (2008 and 2009), discussion group leader, examiner.
Methods: Lectures, field trips, discussion groups, exam.
Number of students: 30-40 per year.
Extent: 20 hours teaching/year + creating lectures and grading exams.

Basic Concepts in Mathematical and Statistical Analysis (BL5021)
Location: St Andrews University, Scotland. Years: 2002-2004.
Basic level. Language: English.
Role: Computer lab assistant.
Methods: Lectures, computer labs, exam.
Number of students: 20-30 per year.
Extent: 20 hours/year.

Modelling Ecological Dynamics (MT5752)
Location: St Andrews University, Scotland. Years: 2002-2004.
Advanced level. Language: English.
Role: Computer lab assistant.
Methods: Lectures, computer labs, exam.
Number of students: 20-30 per year.
Extent: 20 hours/year.

Mathematical Information Technology (MT1008)
Location: St Andrews University, Scotland. Years: 2002-2004.
Advanced level. Language: English.
Role: Computer lab assistant.
Methods: Lectures, computer labs, exam.
Number of students: 40-50 per year.
Extent: 16 hours/year.

In 2000-2001, as part of a PGCE teacher training course, I taught mathematics to GCSE and A-level students at Trinity school, Carlisle, England (ca. 30 hours of teaching).

In the year 2000 I was a tutor to PGCE students for their numeracy test under contract by St Martin's college, Lancaster, England (ca. 12 hours of teaching). In this year I was also a private tutor for GCSE mathematics (ca. 15 hours of teaching).

In the year 1998 I taught mathematics and psychology in Delhi Public School (in India), as part of an exchange programme organised by the CHOICE Experience (ca. 10 hours of teaching).

Teaching and examination methods
I have experience of teaching through giving lectures, assisting students during computer labs and leading discussion groups. I have examination experience with short essay exam questions, multiple choice questions and coding assignments (in python and R).

Master's project supervision
- **Viktor Öhrner** (main supervisor), completed 2023.
- **Erik Everett Palm** (main supervisor), completed 2023.
- **Guangyan Tian** (main supervisor), completed 2022. Resulting publication: Tian G, Harrison PJ, Sreenivasan AP, Carreras-Puigvert J, and Spjuth O. Combining molecular and cell painting image data for mechanism of action prediction. Artificial Intelligence in the Life Sciences, 3, 100060, 2023.

- **Akshai Parakkal Sreenivasan** (main supervisor), completed 2021. Resulting publication: Sreenivasan, A.P., Harrison, P.J., Schaal, W, Matuszewski, DJ, Kultima, K. and Spjuth, O. Predicting protein network topology clusters from chemical structure using deep learning. Journal of Cheminformatics, 14(1), 47 (2022).
- **Victor Malmsjö** (main supervisor), completed 2020.
- **Hongru Zhai** (co-supervisor), completed 2020.
- **Alexander Kensert** (co-supervisor), completed 2018. Resulting publication: Kensert A, Harrison PJ and Spjuth O. Transfer learning with deep convolutional neural networks for classifying cellular morphological changes. SLAS Discovery, 24(4): 466–475, 2019.
- **Anniina Mattila** (main supervisor), completed 2007. Resulting publication: Niitepõld, K., Mattila, A.L.K., Harrison, P.J. & Hanski, I. (2011) Flight metabolic rate has contrasting effects on dispersal in the two sexes of the Glanville fritillary butterfly. Oecologia, 165, 847-854.

Pedagogical education

In 2001-2002 I took a PGCE course *Secondary Mathematics with QTS* (at St Martins college, Lancaster, England) which gave me pedagogical training with respect to teaching mathematics to secondary school children (12-18 years old).

Course development

For the courses I have been involved in at Uppsala University (*Pharmaceutical Bioinformatics with Sequence Analysis (PB-seq)* and *Statistics and Prediction in the Pharmaceutical Sciences*) I have developed lecture material, computer lab exercises, computer assignments, handouts with additional resources and reading lists, and exam questions. In 2020 for the *PB-seq* course I developed a week long module dedicated to deep learning. This involved three lectures, three computer labs and a three-part assignment. The exam questions were a mix of multiple choice and short essay questions.

I was also involved in the development of the new course run by Ola Spjuth's research group at Uppsala University, *Big Data in Life Science*, that began in 2021, particularly on the parts involving deep learning. Although I was not a lecturer on this course, I was a teaching assistant during several of the computer labs.

Pedagogical leadership

In 2008 and 2009 I was the coordinator for the *CBFL* course at Helsinki university (detailed above). This included giving overview lectures, organising and attending field trips and scheduling the lectures, discussion groups, filed trips and exams. Rough "road maps" were made for the discussion groups attended by the students on the course, on topics ranging from climate change to woodland key habitats. The students were however entitled some flexibility as to how the discussions could progress over the weeks.

In 2009 I also gave a half day workshop to members of the Metapopulation Research Group at Helsinki University on *computer intensive statistics for ecologists*. This included lectures and computer practicals.

List of publications

Published in peer-reviewed journals

1. **Harrison PJ**, Gupta A, Rietdijk J, Wieslander H, Puigvert JC, Georgiev P, Wählby C, Spjuth O, Sintorn I-M. Evaluating the utility of brightfield image data for mechanism of action prediction. *PLoS Computational Biology*, 19(7): e1011323 (2023).
2. Tian G, **Harrison PJ**, Sreenivasan AP, Puigvert JC, Spjuth O. Combining molecular and cell painting image data for mechanism of action prediction. *Artificial Intelligence in the Life Sciences*, 3, 100060 (2023).
3. Sreenivasan AP, **Harrison PJ**, Schaal W, Matuszewski DJ, Kultima K, Spjuth O. Predicting protein network topology clusters from chemical structure using deep learning. *Journal of Cheminformatics*, 14(1), 47 (2022).
4. Raykova D, Kermpatsou D, Malmqvist T, **Harrison PJ**, *et al.* A method for Boolean analysis of protein interactions at a molecular level. *Nature Communications*, 13(1), 4755 (2022).
5. **Harrison PJ**, Wieslander H, Sabirsh A, Karlsson J, Malmsjö V, Hellander A, Wählby C, Spjuth O. Deep learning models for lipid nanoparticle-based drug delivery. *Nanomedicine*. 16(13), 1097–1110 (2021).
6. Wieslander H, Gupta A, Bergman E, Hallström E, **Harrison PJ**. Learning to see colours: Biologically relevant virtual staining for adipocyte cell images. *PLOS ONE*. 16(10), e0258546 (2021).
7. Blamey B, Toor S, Dahlö M, Wieslander H, **Harrison P**J *et al.* Rapid development of cloud-native intelligent data pipelines for scientific data streams using the HASTE Toolkit. *Gigascience*. 10(3) (2021).
8. Wieslander H, **Harrison PJ**, Skogberg G, *et al.* Deep learning and conformal prediction for hierarchical analysis of large-scale whole-slide tissue images. *IEEE Journal of Biomedical and Health Informatics*, 25(2), 371-380, (2020).
9. Nordén J, **Harrison PJ**, Mair L, *et al.* Occupancy versus colonization–extinction models for projecting population trends at different spatial scales. *Ecology and Evolution*. 10(6), 3079–3089 (2020).
10. Gupta A, **Harrison PJ**, Wieslander H, *et al.* Deep Learning in Image Cytometry: A Review. *Cytometry Part A*. 95(4), 366–380 (2019).
11. Kensert A, **Harrison PJ**, Spjuth O. Transfer Learning with Deep Convolutional Neural Networks for Classifying Cellular Morphological Changes. *SLAS DISCOVERY: Advancing the Science of Drug Discovery*. 24(4), 466–475 (2019).
12. Oedekoven CS, Elston DA, **Harrison PJ**, *et al.* Attributing changes in the distribution of species abundance to weather variables using the example of British breeding birds. *Methods in Ecology and Evolution*. 8(12), 1690–1702 (2017).
13. Mair L, **Harrison PJ**, Räty M, Bärring L, Strandberg G, Snäll T. Forest management could counteract distribution retractions forced by climate change. *Ecological Applications*. 27(5), 1485–1497 (2017).
14. Belinchón R, **Harrison PJ**, Mair L, Várkonyi G, Snäll T. Local epiphyte establishment and future metapopulation dynamics in landscapes with different spatiotemporal properties. *Ecology*. 98(3), 741–750 (2017).
15. Mair L, **Harrison PJ**, Jönsson M, *et al.* Evaluating citizen science data for forecasting species responses to national forest management. *Ecology and Evolution*. 7(1), 368–378 (2017).
16. Yuan Y, Buckland ST, **Harrison PJ**, Foss S, Johnston A. Using Species Proportions to Quantify Turnover in Biodiversity. *JABES*. 21(2), 363–381 (2016).
17. **Harrison PJ**, Yuan Y, Buckland ST, *et al.* Quantifying turnover in biodiversity of British breeding birds. *Journal of Applied Ecology*. 53(2), 469–478 (2016).

18. **Harrison PJ**, Buckland ST, Yuan Y, *et al*. Assessing trends in biodiversity over space and time using the example of British breeding birds. *Journal of Applied Ecology*. 51(6), 1650–1660 (2014).

19. Studeny AC, Buckland ST, **Harrison PJ**, Illian JB, Magurran AE, Newson SE. Fine-tuning the assessment of large-scale temporal trends in biodiversity using the example of British breeding birds. *Journal of Applied Ecology*. 50(1), 190–198 (2013).

20. **Harrison PJ**, Hanski I, Ovaskainen O. Bayesian state-space modeling of metapopulation dynamics in the Glanville fritillary butterfly. *Ecological Monographs*. 81(4), 581–598 (2011).

21. Niitepõld K, Mattila ALK, **Harrison PJ**, Hanski I. Flight metabolic rate has contrasting effects on dispersal in the two sexes of the Glanville fritillary butterfly. *Oecologia*. 165(4), 847–854 (2011).

22. Tack AJM, Ovaskainen O, **Harrison PJ**, Roslin T. Competition as a structuring force in leaf miner communities. *Oikos*. 118(6), 809–818 (2009).

23. Roslin T, Syrjälä H, Roland J, **Harrison PJ**, Fownes S, Matter SF. Caterpillars on the run – induced defences create spatial patterns in host plant damage. *Ecography*. 31(3), 335–347 (2008).

24. **Harrison PJ**, Buckland ST, Thomas L, Harris R, Pomeroy P & Harwood J. Incorporating movement into models of grey seal population dynamics. Journal of Animal Ecology, 75, 634-645 (2006).

Manuscripts

1. **Harrison PJ**, Rietdijk J, Holmberg D, Puigvert JC, Spjuth O. Exploring the evolution of cellular morphological changes after drug administration based on brightfield image data. *Manuscript* (2023).

2. **Harrison PJ**. Spatial structure and population dynamics of the British grey seal (Halichoerus grypus): inferences from genetic, photo-identification and abundance data. *PhD thesis*. University of St Andrews, Scotland (2006). PhilipHarrisonPhDthesis2006

Other scientific publications/reports

1. Eriksson A, Snäll T, **Harrison PJ**. Analys av miljöförhållanden-SKA 15. Skogsstyrelsen (2015).

2. Foster S, **Harrison PJ**, Buckland S, Elston D, Brewer M, Johnston A, Pearce-Higgins J, Marrs S. Trends of Breeding Farmland Birds in Scotland. Scottish Natural Heritage TREND NOTE. 22:1-6 (2013).

3. Brooker R, Ahrends A, Bailey D, Brewer M, Brown I, Castellazzi M, Gimona A, Ellis CJ, Harding A, **Harrison PJ**, Hopkins C, Moss A, Muir M, Poggio L. Climate change risk-based assessment for notifiable features in Scotland. ClimateXChange Interim Report to the Scottish National Heritage (2013).